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COMPLETE SPECIFICATION

A Process and Apparatus for the Manufacture of Articles from Hardenable Artificial Resins

I, HAROLD DOUGLAS ELKINGTON, M.Sc. (Lond.) F.I.O., Consulting Chemist & Chartered Patent Agent, of Halton House, 20 to 23, Holborn, London, E.C.1, a British subject, do hereby declare the nature of this invention and in what manner the same is to be performed, (as communicated to me by Aug. Nowack Aktiengesellschaft, of Wilthenerstrasse 32, Bautzen, Germany, a Company organised under the Laws of Germany, and Dr. Richard Hessen, of Friedrich-August-Platz 4, Bautzen, Germany, a German Citizen), to be particularly described and ascertained in and by the following statement:—

This invention relates to a process and apparatus for the manufacture of articles from hardenable artificial resins.

In the manufacture of moulded articles from artificial resins by the injection process the filling space of the injection apparatus is charged with the moulding mixture which has been previously prepared. This is effected in the form of tablets or of powder.

Starting with the mechanical mixture of materials, the above process involves two distinct stages in the first of which the mechanical mixture is converted into the moulding mixture as a commercial product, and in the second of which this moulding mixture is converted as a separate operation into the moulded article.

The process of this invention for the manufacture of articles from hardenable artificial resin comprises pressing a mechanical mixture of hardenable resin and fillers, and if desired pigments and other additional materials, through heated mixing nozzles so that a moulding mixture is thereby formed which is directly introduced into a mould.

The process may be modified by interposing a filling space and/or heating space of an injection apparatus between the mixing nozzle and the mould. Injection processes in which the time of moulding is reduced to a minimum are particularly suitable for use in the present invention.

The invention also comprises apparatus for carrying out the process of the inven-

tion which apparatus includes two or more mixing nozzles communicating with a single injection chamber the mixing nozzles being provided with plungers which work in conjunction with one another and the injection chamber being provided with a plunger working in opposition to the aforesaid plungers.

The heat of the moulding mixture leaving the mixing nozzle is with advantage utilised for the moulding process, the nozzle being directly connected with the filling space of the injection-apparatus or to the mould. If it is desired that the mass in the filling space should be at a lower temperature than the mass leaving the nozzle, this can be ensured by allowing the mass to cool or by cooling the same.

In carrying out the process of the invention according to a preferred embodiment the intimate mechanical mixture of hardenable artificial resin, fillers and other admixtures is fed into a heated nozzle and pressed through the nozzle, for example with the aid of a plunger, care being taken to ensure a particularly vigorous movement of the individual particles relatively to one another.

The particularly well mixed and impregnated material is continuously discharged from the nozzle, directly into the mould or the filling space of the injection apparatus, and in the latter case is passed through the heating space of the injection apparatus under pressure and is quickly injected into the actual mould, which, after being filled, is immediately replaced by another mould. Several moulds may, of course, be charged at each filling stroke. The moulds can, naturally, be alike or different.

The process according to this invention is preferably further improved by arranging for the continuous production and supply of the mechanical mixture of materials to the heated mixing nozzle. For example a mechanical mixing device, which, if desired, may at the same time effect grinding, may be connected with the heated mixing nozzle, the material being continuously fed directly from the mixing device into the charging space of the

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heated nozzle. If desired, the starting material may also be fed continuously into the comminuting and mixing device either from suitably disposed supply containers, the discharge of which is adjusted in accordance with the desired proportion, or if desired, directly from the container in which the artificial resin is prepared, over a continuous drying apparatus, for example a drying cylinder, the initial reaction between, for example, formaldehyde and a phenol, being carried out continuously.

By combining the continuous process for the production of the moulding mixture with the injection process it is possible to manufacture finished articles from the starting material without interruption of the process, the advantages being primarily the extraordinary saving in time and further the uniformity of the starting material and the end product.

It has hitherto not been possible to effect either the uninterrupted production of so-called moulding mixtures or the uninterrupted manufacture of moulded articles.

According to the process of this invention it is advisable to employ a plurality of filling spaces and injection apparatus, when employing, for example, two filling spaces and with a plunger in each space these plungers work preferably alternately, a further saving of time being obtained thereby. Each filling space may be fed from one, or preferably a plurality of mixing nozzles. The combination of one mixing nozzle with one filling space is, however, in general sufficient for carrying out the process, since sufficient continuity is obtained by rapid travel of the plunger.

If plungers are employed as compressing members it is advisable in such a process to connect two or more mixing nozzles for the production of the moulding mixtures to a single mould. By carrying the process into effect in this manner a further acceleration is obtained, the heat of the material leaving the mixing nozzle is utilised to a still greater extent. In this embodiment also the mixing device, which may also effect grinding, may be con-

nected directly to the mixing nozzle.

Having now particularly described and ascertained the nature of my said invention and in what manner the same is to be performed, (as communicated to me from abroad) I declare that what I claim is:—

1. A process for the manufacture of articles from hardenable artificial resin which comprises pressing a mechanical mixture of hardenable resin and fillers, and if desired pigments and other additional materials, through heated mixing nozzles so that a moulding mixture is thereby formed which is directly introduced into a mould.

2. A process as claimed in claim 1 wherein the heat of the moulding mixture leaving the nozzles is utilised for the moulding process.

3. A process as claimed in claim 1 or 2, wherein the mixture after leaving the mixing nozzle is passed through a filling space and/or heating space of an injection apparatus before entering the mould.

4. A process as claimed in claim 3, wherein the material is forced through the filling space into the mould by the pressure forcing it through the mixing nozzle without the use of a separate plunger.

5. The process for the manufacture of articles from hardenable artificial resins substantially as described.

6. An apparatus for carrying out the process according to any of the preceding claims, wherein two or more mixing nozzles are provided communicating with a single injection chamber the mixing nozzles being provided with plungers which work in conjunction with one another and wherein the injection chamber is provided with a plunger working in opposition to the aforesaid plungers.

7. Articles when prepared by the process claimed in any of the preceding claims 1 to 5.

Dated this 31st day of July, 1933.

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20 to 23, Holborn, London, E.C.1.